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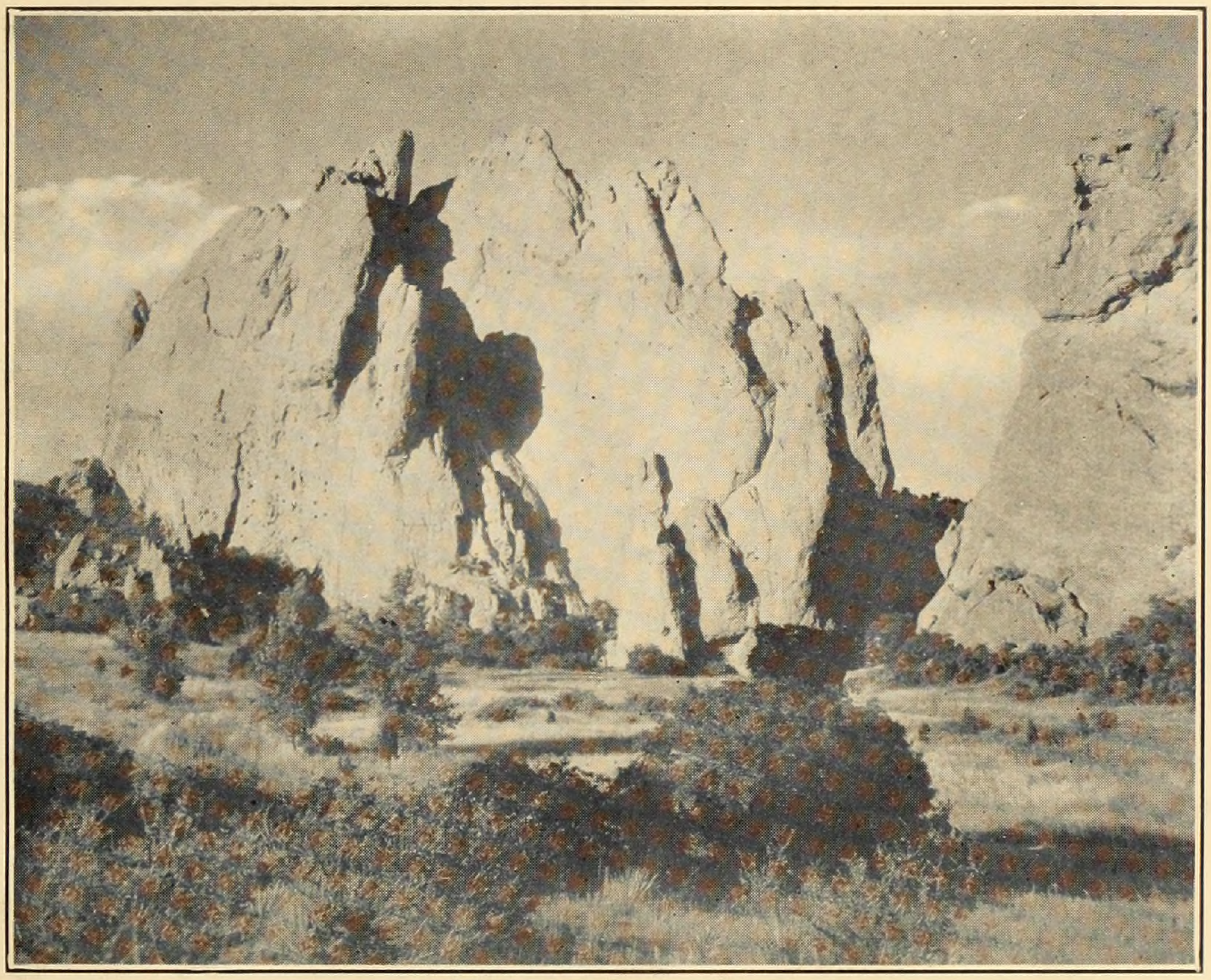

In the Garden of the Gods, Colorado. Reproduced from the Location Library of the American Society of Cinematographers, Hollywood

THIS MONTH:

Panchromatic Negative for Motion Picture Film—By Loyd A. Jones and J. I. Crabtree; Fresh Details on "Vitaphone" Filming; A Professional's Notes for Amateurs {Part IV}—By Joseph A. Dubray, A.S.C.

Vol. VII FEBRUARY, 1927 No. 11

American Cinematographer

FOSTER GOSS, *Editor and General Manager*

Contents:

An educational and instructive publication, espousing progress and art in motion picture photography.
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The EDITOR'S LENS • • focused by FOSTER GOSS

George Eastman Made Honorary Member *of* A.S.C.

FOR the second time in eight years, an honorary membership in the American Society of Cinematographers has been bestowed.

¶ The recipient of the honor is George Eastman, founder and head of the world-famous institution that bears his name. Announcement that Mr. Eastman had been made an honorary member of the A.S.C. was given by Daniel B. Clark, president of the American Society of Cinematographers, at the panchromatic dinner and lecture recently held at the Writers' Club, Hollywood. The only other person accorded honorary membership in the Society is Thomas A. Edison, who was extended his invitation in 1922.

¶ As in the case of Mr. Edison, the multitude of Mr. Eastman's activities may serve to obscure, in the popular mind, just what his contributions to the motion picture industry have been. When the business was in its mechanically embryonic stage, it was Mr. Eastman and his organization who made a new industry possible when they produced a type of film and emulsion that would meet the unprecedented need for rapid and continuous exposure as demanded by the motion picture camera.

A Change *in the* Offing?

¶ With a film on the market to duplicate motion picture negatives, a change is seen by some in the present practice of making foreign negatives. They believe that such will be duplicated from the negative taken primarily for the American market, instead of being photographed separately.

Spanning *the* World

¶ Film manufactured for 16 mm. cameras last year was of sufficient footage to encircle the world, it is reported. Some day all of us are going to wake up to the fact that there is an economic future among those to whom the 16 mm. products go.

Not *a* Catch-all

ONE salient fact brought out by the series of lectures on panchromatic recently given in Hollywood by representatives of the research laboratories of the Eastman Kodak Company is that, while this new type of negative opens an entirely new field for cinematographic thoroughness and sincerity, it cannot be expected to serve as a panacea for all photographic evils.

¶ Panchromatic film is a scientific creation—not a medium of magic which may be called upon to conjure whatever impossibilities that may jump into the mind of the uninformed director or star.

¶ There is the example of the picture comedian who had come to renown on the legitimate. His physiognomy, if it were his fortune, certainly was not such because of its beautific proportions. In fact, one of the initial obstacles, that stood in the way of his cinema career, amounted to whether his facial blemishes could be covered up to the degree that would preclude his being howled off the screen. One day this man demanded panchromatic film for his picture *because he had heard that it would relieve him of the necessity of using make-up!* And that was his only reason for insisting on the kind of film whose chief merit is the faithful reproduction of the minutest details!

¶ Of course, the elimination of the need for make-up in reasonable instances is reckoned as one of the advantages of panchromatic. Even when make-up can be safely dispensed with, vanity would have it applied—as witness the leading lady who, during the course of a picture, repeatedly tried to put it on surreptitiously to hide a sprinkling of freckles about her nose. And it was these very natural marks that the director wanted to be visible to add character to his heroine!

¶ Proper use of filters in conjunction with panchromatic is another subject that will bear careful study. Indiscriminately combining the wrong type of filter with panchromatic may serve to cut out the reproduction of the very colors which the new film allows to register on the negative.

¶ The many advantageous uses of panchromatic may best be served by being familiar with its abuses —and then by avoiding the latter.

Record Lectures Held *on* New Film Subjects

Eastman *and* American Society *of* Cinematographers Co-operate *on* Historic Affair.

Dr. K. C. D. Hickman *and* John I. Crabtree, *in* Hollywood *from* Rochester, Are Speakers.

Signalizing the increasing popularity of panchromatic film in motion picture production, three important meetings and lectures on panchromatic were staged in Hollywood during the past month.

Presented by the Eastman Kodak Company in co-operation with the American Society of Cinematographers, a dinner, followed by an illustrated lecture, was given at the Writers Club, Hollywood, Monday, January 31st. The lecture, dealing in an extensive manner with the general phases of panchromatic, was delivered by Dr. K. C. D. Hickman, of the Eastman Research Laboratories.

Illustrated

Dr. Hickman's lecture was illustrated by slides, and was followed by the projection of a reel of panchromatic experiments photographed under Eastman Research auspices by Ned Van Buren, A.S.C., now connected with the Eastman organization as a consulting cinematographer on panchromatic subjects. Following the exhibition of the reel, Dr. Hickman replied to queries put from the floor of the assemblage.

Record Attendance

The occasion was admitted to be one of the most notable in the history of cinematography. More than two hundred guests including A.S.C. members, laboratory officials and other cinematographers were present. After the dinner had been served, the meeting was opened by George A. Blair, motion picture film sales manager for Eastman and well-known in film quarters. Mr. Blair introduced members of the Eastman staff, including Dr. Hickman, the speaker of the evening; John I. Crabtree, of the Eastman Research Laboratories; Ned Van Buren, A.S.C., who will be permanently located at the Hollywood Eastman headquarters; Perry Conner, representative of the Eastman organization in Hollywood, and Edward O. Blackburn, representative of J. E. Brulatour, Inc., distributors of Eastman motion picture films.

Clark Presides

Mr. Blair then turned the meeting over to Daniel B. Clark, president of the American Society of Cinematographers, as toastmaster and master of ceremonies. Mr. Clark stressed the importance of a thorough understanding of panchromatic practices. He declared that the occasion had brought together probably more cinematographers than had ever been assembled under one roof at one time. This, the A.S.C. president declared, was sufficient evidence of the interest of the cinematographers in the new form of film.

Before presenting Dr. Hickman, Mr. Clark announced that George Eastman, head of the institution bearing his name, had been made an honorary member of the American Society of Cinematographers, and read a telegram from Mr. Eastman accepting the honor.

Crabtree's Lecture

A second lecture was held at the Writers Club, on Tuesday, February 1st, at which time John I. Crabtree, from the Eastman Research Laboratories, spoke.

Mr. Crabtree's talk, which was illustrated by slides, dealt with first, graininess in motion picture film; second, development of panchromatic film and its practical handling in the laboratory; and third, duplication of negatives by a new film just placed on the market.

After concluding his lecture, Mr. Crabtree answered questions from those present.

Lectures on Filters

The third lecture was given by Dr. K. C. D. Hickman at the open meeting of the American Society of Cinematographers on the following Monday night in the A.S.C. assembly rooms in the Guaranty Building.

Dr. Hickman spoke on the use of filters in conjunction with panchromatic. He explained the tonal values of the different colors of the spectrum and their photographic reproduction on panchromatic, with or without filters.

An open forum of questions was held following the lecture.

L. Guy Wilky, first vice president of the A.S.C., presided at the meeting in the absence of Daniel B. Clark, who was in Palm Springs on location.

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Panchromatic Motion Picture Film Negative

First Installment *of* Timely Communication *from* Eastman Research Laboratories.

By Loyd A. Jones, and J. I. Crabtree

Visual Sensitivity, *and* Radiation *and* Light Are Given Introductory Consideration.

PHOTOGRAPHIC materials, from the standpoint of their sensitivity to light of different color, may be divided into three classes: *ordinary, orthochromatic, and panchromatic.* Those belonging to the class designated as *ordinary,* or *blue sensitive,* are sensitive only to blue and blue-green and do not respond appreciably to green, yellow, or red. As typical of this class may be mentioned Eastman Commercial Film and Eastman 40 Plates. By the use of suitable sensitizing dyes photographic materials can be made which, in addition to the blue sensitivity of the *ordinary* type, are sensitive also to green. They are usually referred to as *orthochromatic* and the Par and Super Speed Motion Picture Negative film fall in this class. The use of additional dye sensitizers gives a material which is sensitive also to yellow, orange, and red, thus providing photographic film which responds to the entire visible spectrum. These materials are designated as *panchromatic* and of this class Eastman Panchromatic Motion Picture Negative is a typical example. All of these materials in addition to their sensitivity to visible light are sensitive to those invisible radiations commonly referred to as the ultraviolet. By the use of certain sensitizing dyes the sensitivity can also be extended into the region of longer wave-lengths known as the infrared. For a more complete discussion of this question of the color sensitivity of various types of photographic materials reference should be made to a paper by Dr. C. E. K. Mees[1].

Correct Tonal Relation

It is clearly impossible to hope to render in correct tonal relation a scene containing a wide variety of colors by the use of materials totally insensitive to some of these colors. Thus if a material of ordinary type is used red, orange, and yellow will be rendered as black; and green, which usually has a relatively high visual brillance, will be rendered much darker than blue and blue-green which visually are relatively low in brightness. Some improvement is obtained by using an orthochromatic material since this renders green more nearly in its true position on the tone scale. It is only by the use of *panchromatic* material, however, that correct tonal rendition of all colors can be obtained.

Visual Tonal Values

It is usually desirable in motion picture work to reproduce as truly as possible the visual tonal values of the scene being photographed. Since practically all objects are colored to a greater or lesser degree it follows that the good reproduction of tone values can only be achieved by the use of panchromatic film. The rapidly increasing use of this material in motion picture work indicates that many workers are realizing its value. In the following pages the characteristics of this material will be discussed and attention called to some applications which are of particular importance.

A complete understanding of the principles involved in obtaining any desired reproduction of tone values by the photographic process requires a thorough knowledge of many factors, such as the nature of light and radiation, the sensitivity of the eye and of the photographic materials to radiations of different wave-lengths, the quality of radiation emitted by various light sources used for illuminating the set, the reflection characteristics of objects, etc. Before attempting to discuss the radiation of colored objects by photographic materials differing in color sensitivity it will be necessary to devote considerable attention to these fundamental principles underlying the photography of colored objects.

Radiation and Light

When a solid body such as a piece of carbon or a tungsten wire is raised to a high temperature it emits radiation which travels through surrounding space in the form of wave motion in the ether, a hypothetical medium supposed to pervade all space. This mave motion is of the transverse form and travels in a straight line at the enormous velocity of 186,000 miles per second. The frequency of vibration in this wave motion may vary enormously and since the velocity of pro-

1. Mees, C.E.K., The Color Sensitivity of Photographic Materials, J. Franklin Institute, May 1926, p. 525.

pogation in any particular medium is independent of the frequency it follows that the length of the waves vary inversely as the frequency. Thus *radiant energy* or *radiation* of high frequency has a shorter wave-length than that of low frequency, the *wave-length* being defined as the distance between two successive wave crests.

When radiation of certain wave-lengths falls upon the retina of the eye a sensation is produced which we call *light*. Thus radiant energy, a purely physical or objective phenomenon, when allowed to inpinge on a sense organ, the retina, serves as a *stimulus* producing a subjective sensation or *response* which is designated in general as *light*. The nature of this sensation will be discussed briefly in a later section.

Correct Usage

It may be well to point out at this time that the word *light* is commonly used in more than one sense. It is frequently used as designating the radiation itself and while such usage may be convenient it frequently leads to confusion. The usage of the word light in reference to radiation which does produce the sensation of light is to a certain extent allowable. Further extension of the usage in referring to radiation which does not produce a sensation of light is unfortunate and should be discouraged. Thus the terms ultraviolet light and infrared light are objectionable. It is just as easy to speak of infrared radiation and ultraviolet radiation and this usage is less likely to result in confusion.

Radiant energy being a purely physical or objective phenomenon can be measured and specified in physical units. A radiation consisting of a single wave-length (homogeneous radiation) can be completely defined by two terms, one referring to its quality (wave-length or frequency) and the other to its quantity (energy expressed in *ergs*). As stated previously the radiant energy emitted by a body at a high temperature contains wave trains of many different frequencies or wave-lengths. Such composite radiation may be analyzed into its component parts by use of a prism or diffraction grating. Thus if a beam of sunlight be passed through a prism and allowed to fall on a white surface a band of light varying in color from one end to the other will be seen. This we call a spectrum and its formation depends on the fact that the prism refracts or bends the rays of different vibration, instead of being examined visually, is examined by means of some sensitive receiving instrument (such as a thermopile) which responds to all radiation irrespective of its wave-length, the presence of radiant energy beyond the limits of the visible spectrum will be detected.

Having thus separated such composite radiation into its component parts the intensity and wave-length of each can be measured and in this way a complete and definite physical specification of the radiation obtained. The unit used to measure wave-length is the milli micron (mu) which is equal to one millionth (.000001) of a millimeter. The shortest wave-length which produces the sensation of light is 400 mu, this giving rise to the color which we term violet. The longest wave-length which is visible is 700 mu corresponding to the color which we call red. It should be understood that those limits of visibility are not sharply defined. They vary to a certain extent for different observers and depend very much upon the condition of the observer's eye and the intensity of the observed radiation. Radiation of wave-length shorter than 400 is referred to as ultraviolet, while that longer than 700 is termed infrared. The diagram in Fig. 1 shows approximately the relation be-

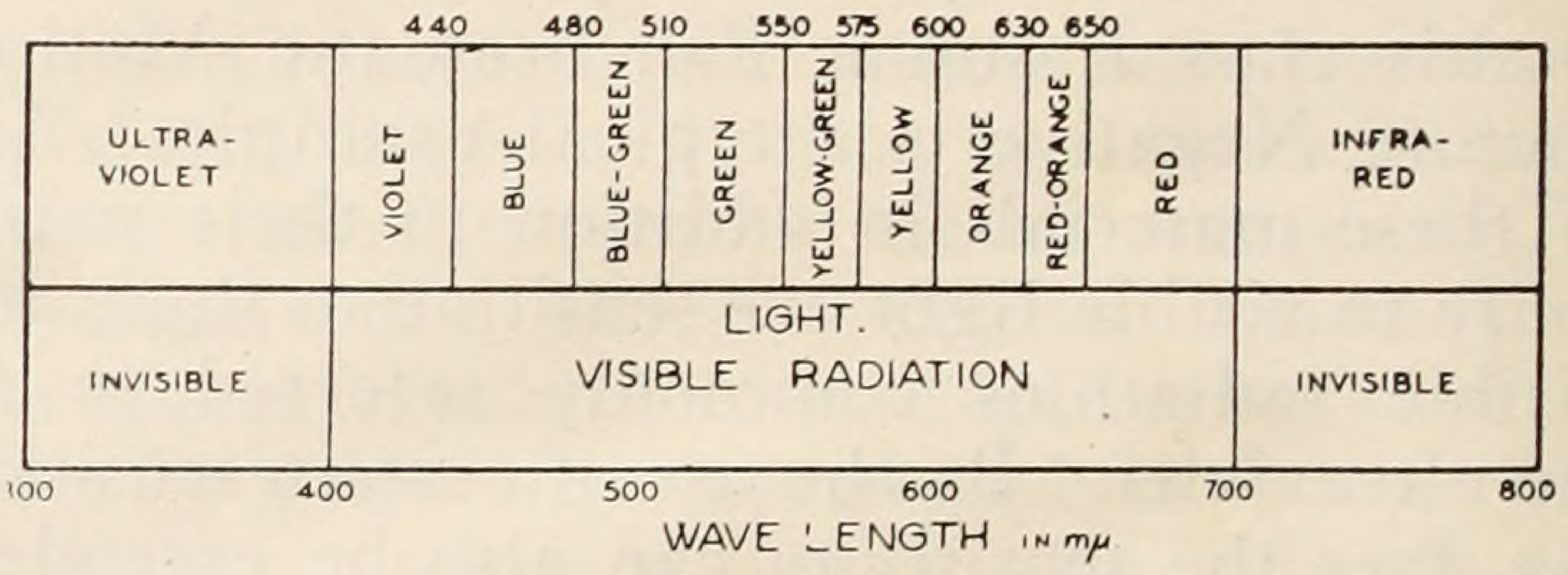

Figure One

tween wavelength of radiation and the color of the resulting sensation. As a matter of fact the complete physical spectrum extends into regions of much longer and shorter wave-length than shown in Fig. 1. But since in motion picture work certain limitations are set by the sensitivity of the eye and the photographic material and the absorbing characteristics of materials used (lens, objects photographed, etc.) it is not necessary in this discussion to consider radiation of wave-length shorter or longer than those included in the diagram.

From the physical standpoint the heterogeneous radiation emitted by various sources of light may be satisfactorily defined in terms of wave-length and the relative amount of energy emitted at each wave-length. Such data are usually expressed in graphic form by plotting energy as a function of wave-length. Curves thus obtained are called curves of spec-

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Amateur Cinematography

A Professional's Notes *for* Amateurs

Part IV
By Jos. A. Dubray, A.S.C.

Principles *of* Reflection *and* Refraction Are Explained *in* Fourth *of* Series *of* Articles

JOSEPH A. DUBRAY
A.S.C.

We have seen in the preceding chapter that a ray of light is *refracted* when passing from one medium into another of different density, and that the angle of *refraction* is smaller than the angle of *incidence,* when the second medium is denser than the first, and *viceversa,* it is greater when the ray passes from the denser medium into the rarer one.

Let us consider a ray of light, whose origin is within a medium denser than the medium into which it emerges at the points of the surface A B. (Fig. 9).

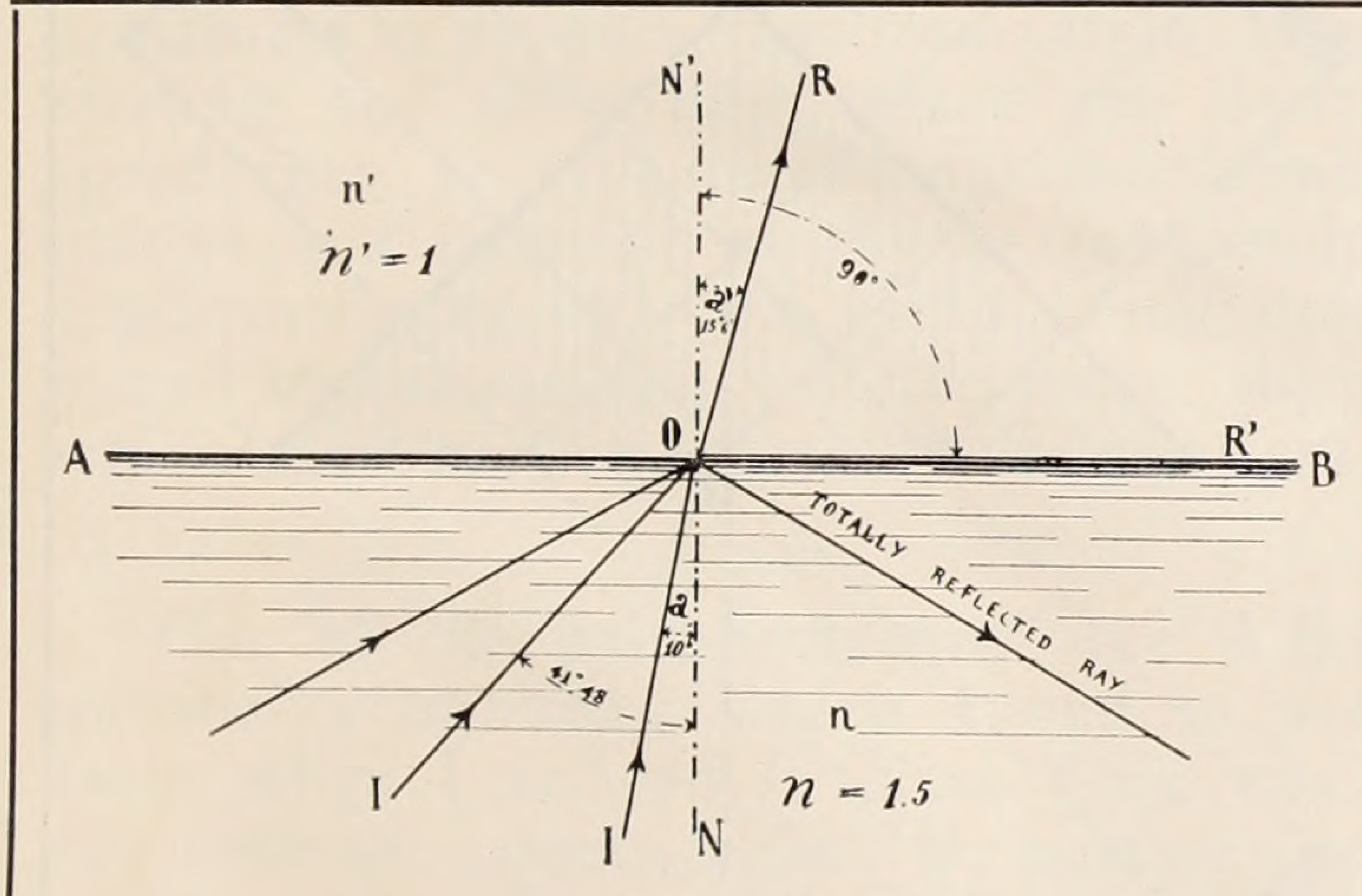

Figure 9

If the original disturbance creating the *incident* ray takes place at the point N′ and the ray strikes the surface A B perpendicularly at O, it will emerge without *refraction,* following the direction O N, and its path N′ N will mark the *normal* to the surface A B.

But if the disturbance is placed at a distance from the *normal,* at the point I for instance, the ray I O will be refracted into the less dense medium, making an *angle of refraction* a' greater than the *angle of incidence* a.

Critical Angle

Now, it is evident that if we gradually increase the magnitude of the angle of *incidence,* a certain position of the *incident* ray will be reached, where the *refracted* ray will emerge, following a path parallel to the refracting surface. In other words, a certain angle of incidence will be found, whose corresponding angle of refraction will have a magnitude of 90°. This particular angle of incidence is called the *critical angle* of the substance of which the denser medium is composed.

In Figure 9, the ray I′ O, forms with the normal the *critical angle* of the medium n, and the refracted ray O R′, forms with the normal N N′, an angle of refraction equal to 90°.

If the angle of incidence is still increased, and becomes then *greater* than the *critical angle,* as the angle of incidence made by the ray I^2 O in the Figure, the ray *cannot emerge* into the rarer medium, and is *totally reflected* back into the denser medium, following the Laws of Regular Reflection, i.e., making with the *normal, an angle of reflection,* equal to the *angle of incidence.*

Now, according to the Laws of Refraction:

$$\frac{\sin a}{\sin a'} \text{ equals } \frac{n'}{n}$$

(in which a and a' are respectively the angles of incidence and refraction, n the index of the medium into which lies the incident ray, and n' the index of the medium into which lies the *refracted ray*), therefore,

$$n \text{ equals } \frac{\sin a' \,.\, n'}{\sin a}$$

and as in the case in which the *incident ray* makes with the *normal* the so-termed *critical angle,* the value of the angle a' is known to be 90°, whose sine value is 1.000, we have

$$n \text{ equals } \frac{1.000 \,.\, n'}{\sin a}, \text{ or, } n \text{ equals } \frac{n'}{\sin a}$$

Now, let the medium n' in Fig. 9, be Vacuo, whose index of refraction is 1.000 and let n,

be the index of a denser medium totally reflecting an incident ray, that makes with the normal at its surface of separation an angle of incidence of, say, 45°.

Substituting the known values in the above formula:

$$n \text{ equals } \frac{n'}{\sin a}, \text{ we have,}$$

$$n \text{ equals } \frac{1}{\sin 45^\circ}, \text{ or } n \text{ equals } \frac{1}{0{,}7071}, = 1{,}414$$

It results that, *a medium whose surface of emergence is in contact with Vacuo, must have an index of refraction greater than 1.414, in order to totally reflect a ray incident to that surface, at an angle of 45°.*

All glasses answer to this requirement

If we suppose the medium n of Fig. 9 to be Crown Glass, having an index of 1.5, its critical angle when in contact with Vacuo is easily found thus:

$$\frac{\sin a}{\sin 90^\circ} \text{ equals } \frac{1.5}{1}, \text{or, } \sin a \text{ equals } \frac{\sin 90^\circ \,.\, 1}{1.5}$$

and as the sin value of 90° is 1, we obtain

$$\sin a \text{ equals } \frac{1}{1.5} \text{ equal } 0.6666 \text{ or approximately}$$

41° 48′.

The *critical angle* of Crown Glass, having an index of 1.5, is then an angle having a magnitude of 41° 48′.

IT IS evident, that the *critical angle* of a medium varies with its density, and it is *greater,* the *rarer* is the medium: so, as the critical angle of Crown Glass, as stated, is 41° 48′, the critical angle from *water* to *Vacuo* is approximately 48° 45′, while from *diamond* to *Vacuo* is only about 20°, which small value greatly accounts for the brillancy of this medium, because all the light that strikes a diamond at an angle greater than 20°, is *totally reflected* when it strikes its bottom surface. A diamond is always mounted by jewelers in an open, or bottomless setting, as proof that its sparkle is due to its own density and not to any reflecting surface placed underneath it.

IN *total reflection,* there is *no loss of light* by absorption or transmission as is the case in regular reflection, and this valuable property is taken advantage of in making optical instruments in which perfect reflection is desired.

The most important application of this phenomena, in optical instruments, is the use of *right angled prisms.*

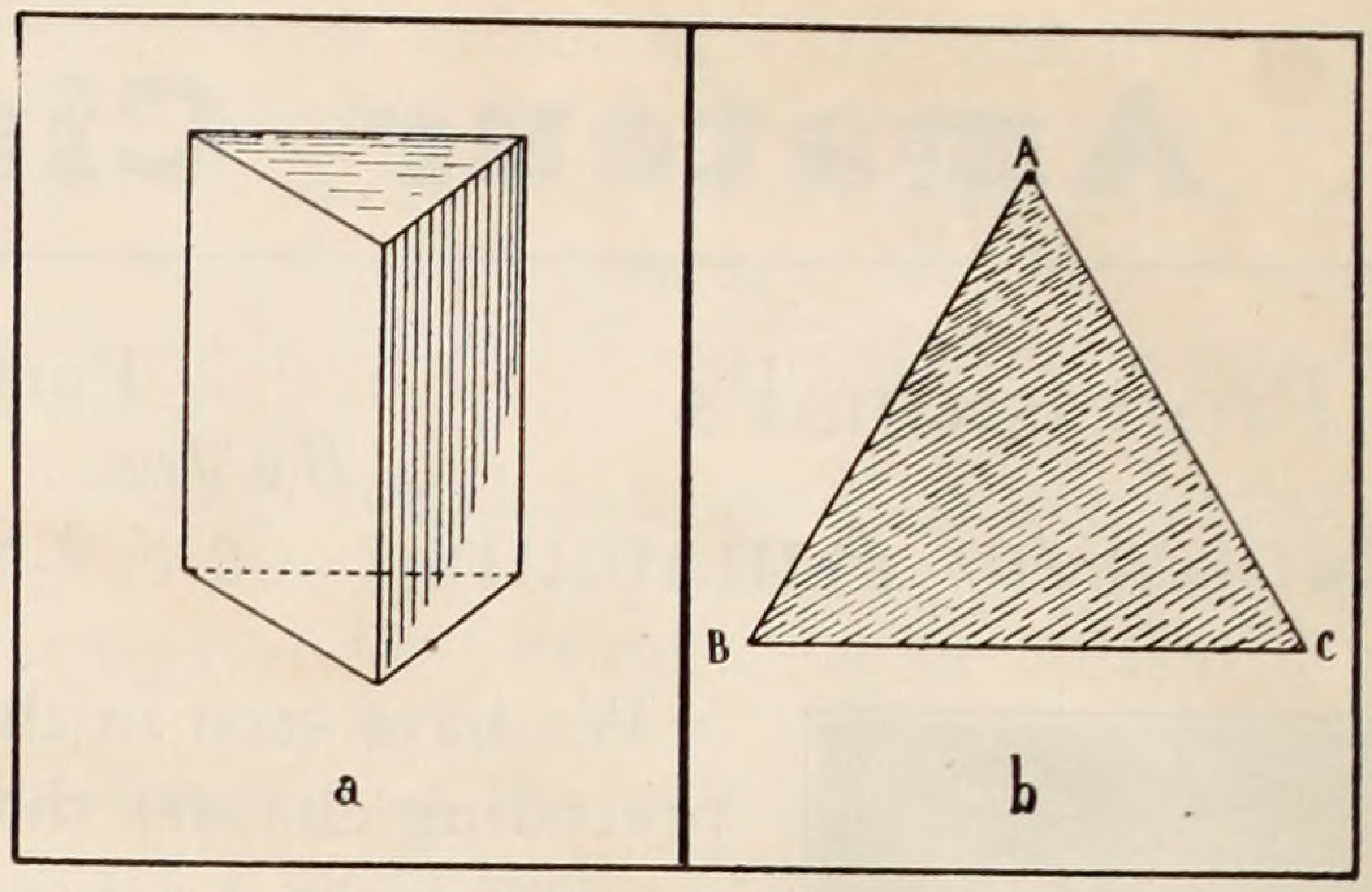

Figure 10

IN optics, a prism is any *transparent medium,* bounded by two plane surfaces, inclined to each other (Fig. 10a).

and whose principal Section (Fig. 10 b.), perpendicular to the *edge* A A′ is a triangle.

In the section, A is called the *summit;* B C the *base* and the angle B A C, the *refracting angle.*

A right angle prism, is a prism, whose refracting angle is a *right angle,* or an angle of 45°.

LET us suppose such a prism A B C, made of Crown Glass (Fig. 11).

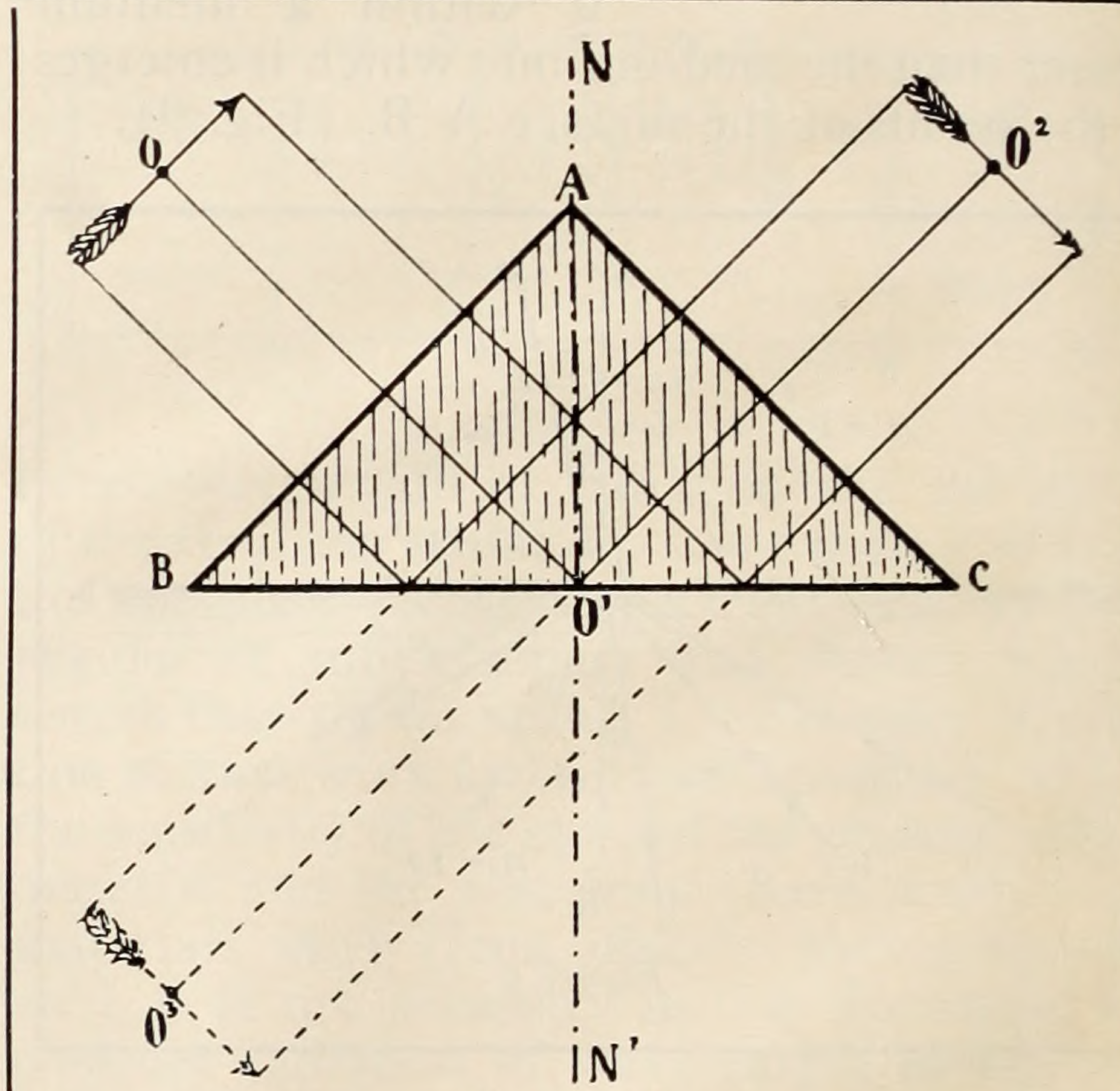

Figure 11

A ray from O, falling perpendicularly on the face A B, enters the prism without being refracted and strikes the hypothenuse B C at O′, making with the normal N N′, an angle O O′ N, of 45°.

As the critical angle of Crown Glass, is of less magnitude, (41° 48′) the incident ray, is

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Fresh Details *on* "Vitaphone" Filming

Different Noiseless Method *of* Lighting Devised *to* Escape Recording Sensitivity

Additional details concerning the photographing of subjects for Warner Brother's "Vitaphone," the medium of "talking motion pictures" now enjoying wide application, are given by E. B. Du Par, who, a member of the American Society of Cinematographers, has been in charge of the cinematographic end of the device.

"One of the things," Du Par states, "that made Vitaphone possible was the 'synchronus' motor. Instead of using one motor and driving the camera and the recording machine from opposite ends, which at first was thought to be the simplest way, we now have from two to four motors all going at the same time and electrically interlocked so that they are all in perfect synchronization. An electrical gearing device holds them at exactly the same speed. The motors are interlocked electrically by tapping at three symmetrical points on each armature and by interconnecting the different motors through slip rings. Thus the motor driving the recording machine and the motors driving the different cameras are independently supplied with electrical energy, but through the slip ring circuit there is enough interchange of power between their armatures to produce synchronization. While starting and when they reach the desired speed they are converted into synchronous motors and continue to run as independent synchronous motors, the speed being determined by the frequency of the power supply which can't vary one-tenth of one per cent.

Noise

"One of the first problems," the A.S.C. member continued, "which I had to overcome when I arrived in New York was to cut down the camera noise. By putting a special clutch on the magazine take-up—and, by the way, we had this feature patented—changing the intermittent movement in the camera, using a special belt and shooting from a sound-proof camera booth, the operation of the camera was made so quiet that you could get within ten feet of the microphone, where before it was impossible to get closer than 25 feet.

Quiet Light

"The next problem was to get the light quiet enough to work with. After a number of experiments and tests, I decided to use the G.E. high intensity arc light in conjunction with special spot lights and Cooper Hewitts. But before they could be used at all, they had to be re-made with all gears and moving parts constructed of fiber. It is a very severe test that these lights have to undergo. They have to burn from 11 to 15 minutes at a time and be absolutely noiseless, because a little flicker of the arc or carbon sounds like a pistol shot on the finished record.

Side Arcs

"After working with these lights for a while, I decided that I would like to use some side arcs, or broadsides, as they are called in the studio. Remembering the different light troubles which I had to overcome while working for Warner Bros. in Hollywood, I naturally thought of Frank N. Murphy, the chief electrical engineer of the West Coast studio. I wrote to Mr. Murphy, telling him what I wanted. He conferred with Harry Brown, another wizard of electricity, and they evolved a noiseless broadside. Believe me, I was glad to get these lights. I received a shipment of them just before I left New York, and they proved even better than I expected. Before that, I had to use all spots or G.E.'s, and it took a man for each spot. Now I can put broads around where I want them.

"The reason, of course," Du Par continued, "that we need the noiseless lights is because the microphone is so sensitive that everything has to be absolutely quiet while photographing, as the recording machine gathers the different sounds by a special microphone which translates them into voltage fluctuations—the vibrations caused by the sounds striking the diaphragm. The minute fluctuations are in turn amplified by a vacuum tube amplifier until they have sufficient power to operate the device or stylus which cuts the minute lines in the record of soft wax. This wax is 16 inches across, and runs for approximately 11 minutes, or equal to 1,000 ft. of film when projected at the speed of 90 feet per minute. Incidentally, that is the speed at which we have to take pictures with our camera—24 pictures per second, which is one-half again as fast as the natural speed of 16 pictures per second.

(Continued on Page 15)

In Camerafornia...

and News Notes of the Month

REGINALD LYONS, A.S.C., has finished photographing "Whispering Sage," a Fox production starring Buck Jones. Scotty Dunlap directed. Reggie will go on location to Sonora, Calif., for the filming of the next Jones vehicle, "The Holy Terror," which will be directed by Lambert Hillyer.

* * *

Walter Griffin, A.S.C., is photographing an all-star production, "Justice of the Damned." David Hartford is director and producer.

* * *

Charles Van Enger, A.S.C., shares honors with John Francis Dillon, director; Carey Wilson, scenarist, and other members of the staff and cast of First National's "The Sea Tiger," which, starring Milton Sills, was completed and sent to the cutting room without the necessity of a single retake or additional scene. Van Enger was chief cinematographer on the production.

* * *

Frank Cotner, A.S.C., is filming "A Ghostly Affair." Hallam Cooley is starred.

* * *

Robert Kurrle, A.S.C., has concluded the cinematography on Inspiration's and Edwin Carewe's production of "Resurrection," and has begun his duties as chief cinematographer on First National's "The Tender Hour," in which, directed by George Fitzmaurice, Ben Lyon and Billie Dove head the cast.

* * *

James Van Trees, A.S.C., is chief cinematographer on First National's "Big Bertha," a feature comedy of the war. Del Lord is directing.

* * *

Arthur Edeson, A.S.C., is still busy with "The Patent Leather Kid," a First National production starring Richard Barthelmess.

IN the January issue of *American Cinematographer,* it was chronicled that Herford Tynes Cowling, A.S.C., had passed through a banner month during the weeks just then closing. It comes to pass that the past month continued big events in Cowling's life as, on January 14th, in New York City, he was united in the bonds of matrimony to Virginia Ramsay Hardin. Congratulations!

* * *

Glen MacWilliams, A.S.C., is photographing Alma Rubens in "Heart of Salome," at the Fox Studios. Victor Schertzinger is directing.

* * *

Jackson J. Rose, A.S.C., is filming Universal's production of "Cheating Cheaters," which is based on the famous stage play of the same name.

* * *

Ira Morgan, A.S.C., is having the aerial antics of army balloons to film in Metro-Goldwyn-Mayer's "Red, White and Blue." Sam Wood is the director.

* * *

Gilbert Warrenton, A.S.C., is in the final stages of the cinematography on Universal's "Beware of Widows," starring Laura La Plante. Wesley Ruggles is directing.

* * *

Henry Sharp, A.S.C., is chief cinematographer on King Vidor's production, from his own original story of "The Mob" at the M-G-M studios. Eleanor Boardman is starred.

* * *

E. B. Du Par, A.S.C., having returned to Hollywood from New York City where he filmed Warner Brothers' Vitaphone presentations, is serving as chief cinematographer on Warner's "White Flannels." Lloyd Bacon is directing. Du Par is one of the veteran cinematographers on the Warner Bros. staff, being affiliated with that organization for the past five years.

HARRY PERRY, A.S.C., and Paul P. Perry, A.S.C., have returned to Hollywood from San Antonio, Texas, where they have been for the past five months photographing Paramount's "Wings," on which Harry is chief cinematographer. They are concluding the filming of the picture at the studios of Famous Players-Lasky.

E. Burton Steene, A.S.C., is the last of the cinematographers on the feature to remain in San Antonio. He is staying at the Texas location to capture Akeley shots of cloud effects.

* * *

Henry Cronjager, A.S.C., is to film the Metropolitan production, "The Heart Thief," starring Joseph Schildkraut.

* * *

Victor Milner, A.S.C., has been assigned as chief cinematographer on Paramount's "The Man Who Forgot God," which will be Emil Janning's first American starring photoplay.

* * *

Barney McGill, A.S.C., is filming "Two Arabian Knights," a Caddo production for United Artists release. William Boyd is starred; Lewis Milestone is directing.

* * *

Al Gilks, A.S.C., is filming James Cruze's production of "Looie the Fourteenth," starring Wallace Beery.

* * *

Ernest Palmer, A.S.C., has returned from an extensive trip across the Atlantic where he was cinematographer on a film expedition by the Fox Film Corporation.

* * *

Sol Polito, A.S.C., is shooting Ken Maynard in "The Land Beyond the Law" for First National release.

Charles J. Davis Elected *to* A.S.C.

New A.S.C. Member Began Career *with* Old Vitagraph Company; Now *with* Vitaphone

Charles J. Davis has been elected a member of the American Society of Cinematographers, according to an announcement of the A.S.C. Board of Governors.

Davis, who is now connected with the Vitaphone Corporation for whom he has been associated with E. B. Du Par, A.S.C., in the filming of the Vitaphone programs to date, began his career as a cinematographer with the old Vitagraph company in New York City, in November. 1915. Since that time he has been chief cinematographer on innumerable important productions.

With Vitagraph

Among the vehicles which he filmed for Vitagraph were: "The Man Behind the Curtain," "The Chattel," "The Man of Mystery," "An Enemy to the King," "Mystery in the North Case," "Missing," "Marked Stamps," "Strictly Business," "Sixteenth Wife," "A Service of Love," "Vanity and Sables," "The Menace" and "The Girl of Today."

During 1918, Davis went with E. A. Neuman to Europe and made a series of. E. A. Neuman productions, which, based on the war, were titled as follows: "War Time in England," "London, 1918," "War-time France," "Paris, 1918" and "War-time Italy."

On returning to the United States, the new A.S.C. member worked on the following productions: "Wolves of Culture," a Pathe serial; "Fighting Roosevelt," a Warner Bros. production; "Soul of a Nation" and "The Collar Line," H. E. Hancock productions. He then became connected with Vitagraph again, filming "The Friendly Call," "Slaves of Pride," "Sporting Duchess," "Captain Swift," "Whisper Market" and "The Broadway Bubble."

CHAS. J. DAVIS, A.S.C.

Back to England

In 1920, Davis went to London, England, as chief cinematographer of "On the Road to London," a Bryant Washburn production, which was finished in California.

With Vitaphone Again

When the Washburn feature was finished, Davis journeyed to New York where he again became affiliated with Vitagraph, for whom he photographed "Moral Fibre," "Single Track" and "The Prodigal Judge."

He then filmed a series of Burton King productions including "The Mad Dancer," "The Truth About Women," "Those Who Judge" and "Playthings of Desire."

Concluding this series, he was in charge of the cinematography on two Sam Sax productions, "A Little Girl in a Big City" and "Police Patrol."

Following this pair of releases, he was chief cinematographer on a series of features produced by the McFadden Publishing Co., numbering "Broken Homes," "The Joke," "False Pride," "Things Wives Tell" and "Men, Women, Love." Succeeding the McFadden engagement, he became identified with the Vitaphone organization, his present affiliation.

Nick Musuraca, A.S.C., is to film "Cyclone of the Range," an F.B.O. feature, starring Tom Tyler and directed by Bob De Lacy.

* * *

Charles Rosher, A.S.C., has concluded the cinematography on "Sunrise," F. W. Murnau's production for Fox. George O'Brien and Janet Gaynor are starred.

* * *

John F. Seitz, A.S.C., is making preparations to withstand the winter rigors of Colorado where he will go on location as chief cinematographer on Metro-Goldwyn-Mayer's production of Robert W. Service's "The Trail of '98," which Clarence Brown will direct.

* * *

Joseph Dubray, A.S.C., has recently finished the cinematography on the Tiffany production, "The Broken Gate." Stephen Norton, another member of the A.S.C., was associated with Dubray on this production which featured Dorothy Phillips, Florence Turner, Jean Arthur, Buster Collier, Phillip Smalley and Charles "Buddy" Post.

* * *

Philip H. Whitman, A.S.C., has re-joined the scenario forces of the Mack Sennett studios, where, it is understood, he has written a story based on the swimming of the Catalina channel.

A Friendly Sort of Camera!

FRED NIBLO famous Metro-Goldwyn-Mayer Director explains Eyemo to his five-year-old daughter

The BELL & HOWELL

MAKES MOVIES AS THE EYE SEES

Eyemo

REGISTERED

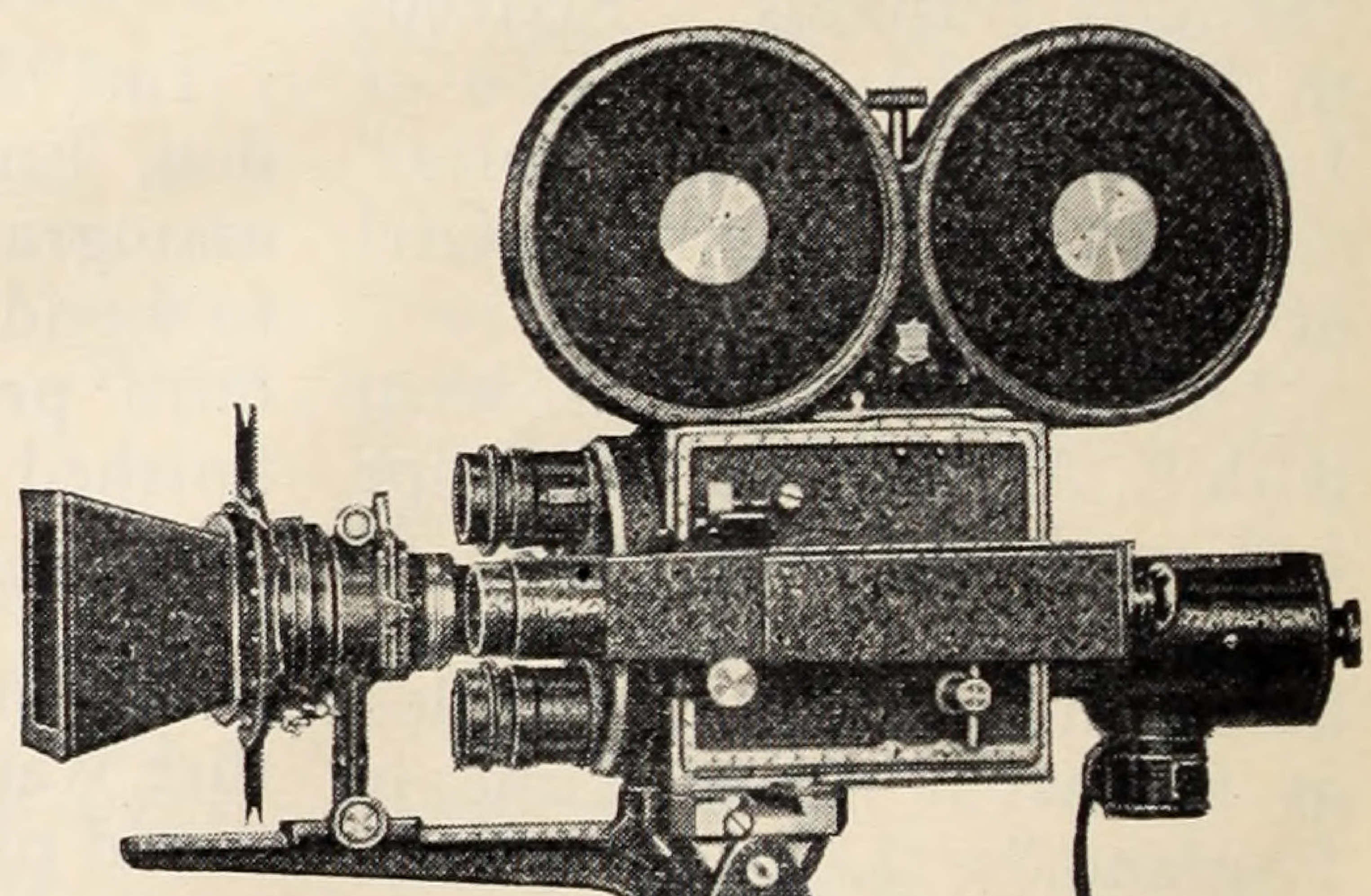
Standard Automatic

for stunt shots, locations, news reels and anything in a hurry

The Eyemo Camera, shown in the hands of Fred Niblo, above, is the zippy little professional camera now seen wherever you see cinema people. It's the kind of camera you want to pal with. It's a bit of the home lot you can pack in a grip and take to the ends of the world.

Eyemo has proved its professional worth in many a feature picture. For stunt shots, news reels and locations, you can't beat it. Few studios are without it—and none *should* be. As a personal accessory for recording your friends, trips and outings it's a jewel, too. This is the camera that flew over the North Pole with Lt.-Commander Byrd and again with Ellsworth and Amundsen. It has gone to Alaska, Africa, Asia and wherenot with famous expeditions. Newspapers and exhibitors are using it for "neighborhood" scoops. The pictures it gets are only matched by those taken with the old reliable Pioneer Bell & Howell Standard that has been a familiar property in moviedom for twenty years.

There's a special descriptive circular ready to mail anyone who wants to know more about Eyemo. Write now and get it.



The Bell & Howell Pioneer
PROFESSIONAL STANDARD

Through this camera the best thought, talent and effort in the industry have been brought to the eyes of the world for the past twenty years. It is the camera used by practically all the world's leading producers.
The Bell & Howell pioneer Standard keeps up with every improvement demanded in the making of better pictures. Detail parts are interchangeable. The pilot register movement is basically patented. This camera never grows obsolete no matter how old. Displays at our Hollywood, Chicago, New York and London offices. Descriptive literature on request.

Bell & Howell Co.

1805 Larchmont Ave., Chicago, Ill.
New York, Hollywood, London
Established 1907

"VITAPHONE" FILMING

(Continued from Page 11)

No Fluctuations

"When reproducing," the A.S.C. member explained, "the film and the record are placed in their respective machines with a given mark indicating the starting point. They are coupled to opposite ends of the same motor, the speed of which is held constant by means of a vacuum tube regulator. It is essential that the mechanical gearing be so designed that mechanical vibrations and irregularities of load in the projector should not cause fluctuations in the speed of the record or film. To avoid this, a flywheel and flexible connection are placed between the last gear-driven shaft and the turntable, which iron out the ripples in the speed.

Vibrations

"The sound is brought to the audience by an electrical reproducer that converts the delicate movements of the needle in the grooves of the disc into electrical vibrations—which pass through an adaptation of the Western Electrical public address system.

"But to return to the camera end of it: We have from two to four cameras going at one time. The long-shot camera, which is in charge of C. J. Davis, is what we call the master camera. It takes the master film and is interlocked with the recording machine. Once it starts, it keeps going till the end. The close-up camera, operated by myself, has a synchronous motor and can be started and stopped at will. I have taken as many as ten close-ups during one number, or in the space of 11 minutes. I have four lenses on the camera, ranging from a 40 mm. to a six-inch. They are all focused in advance. All I have to do is to change them, and panoram the camera to the next object to be photographed. I often wish for an extra set of hands as I am as busy as a one-armed paper-hanger, and the booth is too small to permit my assistant to come in with me. As the booth is sound proof, I have to depend on light signals given me by Mr. Heller, the director. He is both music and picture director. If you have ever watched a director, who, when anything goes wrong with the action, begins to tear his hair and yell at the actors, you can realize that Mr. Heller's is some job. He has to be as quiet as a deaf mute. Of course, he has the privilege of pulling his hair if he wants—just as long as he does it in a silent manner, so that the microphone won't pick up any spurious sounds. After the record starts, all his talking must be done with his hands or by means of other signs. At times I wonder how he keeps his patience.

"We have just finished a program for 'Manon Lescaut,' the latest Warner production starring John Barrymore. Some of the artists used are Charles Hackett, grand opera singer; Schuman-Heinck, Van and Shenk, Harry Lauder, Whispering Smith, Mary Lewis and another number by Mischa Elman."

Junior Cameramen's Club *to* Hold Dance, Saturday, March 12

The Junior Cameramen's Club is to hold its first annual dance and entertainment in the ballroom of the Hollywood Masonic Temple on Saturday evening, March 12.

Final plans have been made to make this an elaborate and brilliant affair. Hank Mann will be master of ceremonies. To assist him in entertaining he will have such screen artists as Sammy Blum, Arthur Lake, Sammy Cohen, Nick Stuart, Carol Lombard, George Blandford and Barbara Luddy. Several skits are being arranged by the boys in the club.

The ticket sales are going on very satisfactorily. Each member of the club is on the committee in charge of selling tickets which may be secured from them.

Joseph Brotherton, A.S.C., is in charge of the photography in "Keith of Scotland Yards," starring Hayden Stevenson. Production is under way at Universal with Robert Hill directing. Many unusual fog shots are being incorporated in the picture.

Amateur Cinematography

(Continued from Page 10)

totally reflected in the direction O′ O², and its *virtual image* will be seen at O³ by an eye placed at O².

Totally Reflected

It is evident that all rays emanated by a luminous source or object placed at O, which fall perpendicular to A B, will be totally reflected at their striking the hypothenuse B C, and a virtual image of the source or object will be seen at O³.

Thus the surface B C, acts as a mirror and as in total reflection there is no *loss of light,* this surface acts as *the most perfect plane mirror.*

In optical instruments, right-angled prisms are most frequently used instead of metallic mirrors, which tarnish very easily, and demand the greatest of care in their manipulation.

IN giving the physical explanation of the phenomena of refraction, we have considered the rays of light, to be refracted from *air* into *glass* and again from *glass* into *air,* and the two refracting surfaces were considered parallel to each other.

As, in the case of a prism, the two refracting surfaces are inclined to each other, it is evident that the ray of light refracted within the prism, cannot emerge from it into air, in a direction parallel to the original incident ray, as it was the case with parallel refracting surfaces.

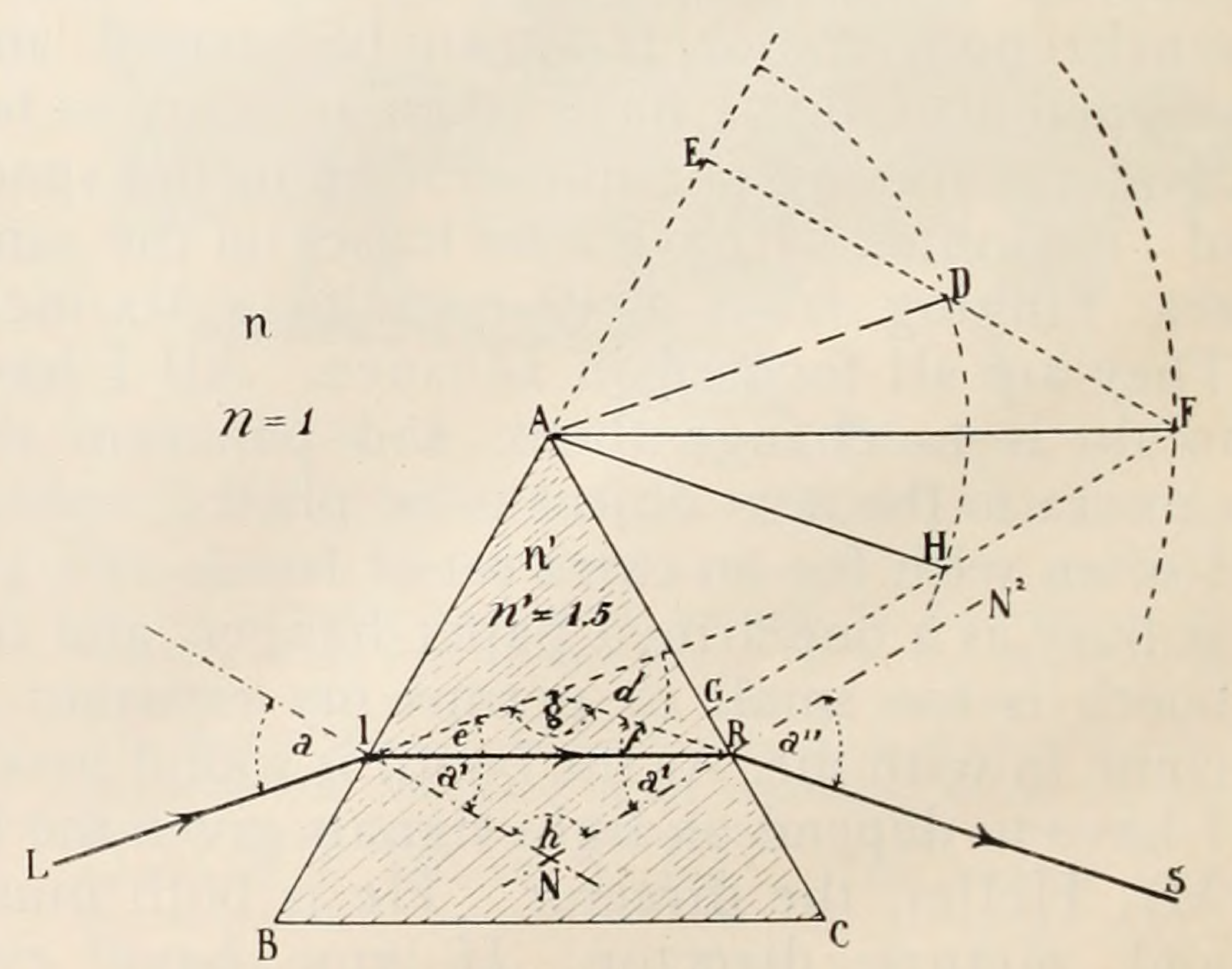


Figure 12

Let us consider a *prism* A B C, made of *glass,* and placed in the medium *air* and let L, be the luminous source, that emits the monochromatic ray L I, incident to the surface A B at I at an angle of incidence ***a***.

Law of Refraction

As the Law of Refraction expresses a definite relation between the angles of incidence and refraction for a given refracting medium, it is evident that if the path of the incident ray and the indices of the two media are known, it is possible to trace a geometrical construction giving the paths of the refracted rays at the entrance and at the emergence from the prism.

In Fig. 12, let the glass prism have a refracting index equal to 1.5 and, for sake of simplicity, let us call 1. the refracting index of the sourrounding medium air.

(The actual refracting index of *air* at the standard pressure of 760 millimeters and a temperature of 0° centigrades is 1.000294) and let the incident ray strike the surface A B, at an angle of incidence ***a***.

Using the vertex A of the prism as center, draw an arc having a radius of any convenient length A F, and another concentric arc having a radius equal to $\frac{n}{n'}$. r: in our case, equal to $\frac{1}{1.5}$ .45 mm. or equal to 30 millimiters.

Trace the line A D parallel to the known incident ray, and from D, the line D E, perpendicular to the first refracting surface of the prism. Prolong this line until it will meet the first arc at F. The line I R, drawn parallel to A F, will represent the path of the refracted ray within the prism.

To find the path of the ray emerging from the prism into air, trace the line F G, perpendicular to the second arc at H. The line R S, parallel to A H, will then represent the path of the ray refracted from the prism into air.

The proof of this construction is as follows:

The sin values of the angles A D E and A F E are:

sin. A D E equals $\frac{A\,E}{A\,D}$ and sin. A F E equals $\frac{A\,E}{A\,F}$, and consequently, $\frac{\sin. A\,D\,E}{\sin. A\,F\,E} = \frac{\frac{A\,E}{A\,D}}{\frac{A\,E}{A\,F}}$ equals $\frac{A\,F}{A\,D}$ and as the lines A F and A D, have been traced in the ratio $\frac{n'}{n}$, we have $\frac{\sin. A\,D\,E}{\sin. A\,F\,E}$ equals $\frac{n'}{n}$.

But the angle A D E and a (angle of incidence) are equals, because formed by the junction of lines parallel by pairs, and similarly, the angle A F E, is equal to the angle a', (angle of refraction); then,

$$\frac{\sin a}{\sin a'} \text{ equals } \frac{n'}{n}$$

which is the formula expressed by Snell's Law.

In like manner, the correctness of the path of the emergent ray R S can be proven.

BY prolonging the rays L I and R S within the prism, we find that they form at their junction an angle d which is called the *angle of deviation* of the prism, because it represents the total deviation of the ray of light, caused by its passage through the prism.

WE shall now consider different rays of monochromatic light, striking the surface A B of a prism, at different angles of incidence, and for the sake of clearness we will draw three separate figures of the same prism as in Fig. 13.

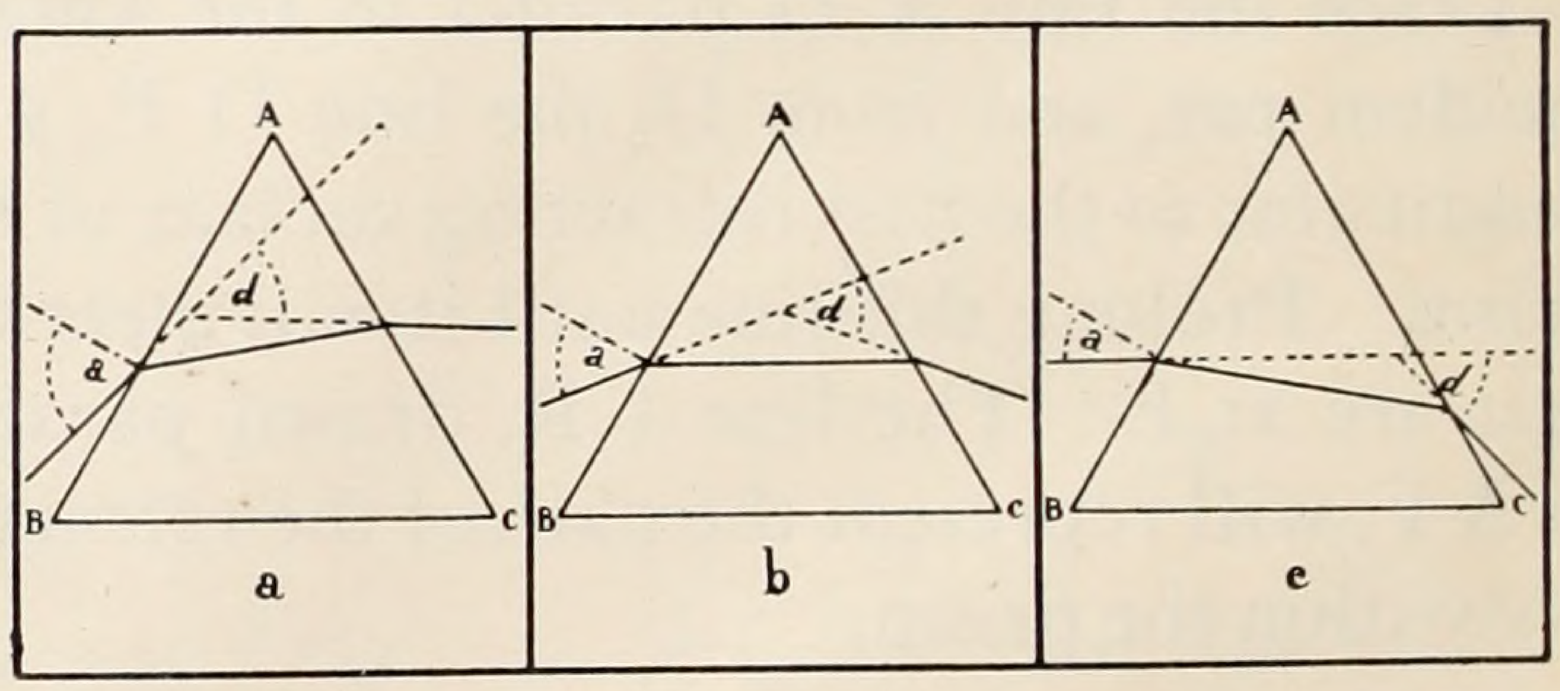


Figure 13

The prism A B C being of *glass,* index equal 1.5 and the sorrounding medium being air, we notice that, if the angles of incidence are *decreased in magnitude,* the corresponding *angles of deviation do not decrease proportionally.* In fact the angles of deviation in Fig. a and c, are *both greater than the angle of deviation in Fig. b.*

In any prism, there is then a certain *deviation, less than any other* and it can be mathematically proven, that this *angle of minimum deviation* occurs when the angle of incidence to the surface A B and the angle of refraction from the surface A C, are *equals* and that the ray within the prism, follows a path *parallel* to the base of the prism itself.

Angle of Minimum Deviation

The angle of minimum deviation can be experimentally shown by letting a pencil of light, in a dark chamber to be refracted by a prism, vertically placed, so as to make a large angle of incidence.

A disc of light can be seen on a screen placed at a certain distance from the prism. If the prism is gradually turned so as to decrease the magnitude of the angle of incidence, we notice that the disc of light on the screen displaces itself to a certain position, from which it returns towards its original one, though the prism, is still rotated in the same direction.

THE angle of *minimum deviation* permits the determination of the index of refraction of any substance, from Fraunhofer formula:

$$n = \frac{\sin.\dfrac{A+d}{2}}{\sin.\dfrac{A}{2}}$$

in which, A, is the refracting angle of the prism and *d*, the deviation, both of which angles are easily determined by the use of a spectrometer.

The correctness of Fraunhofer formula can be deduced from Fig. 12, in which the prism is placed so as to obtain the angle of minimum deviation of the incident ray L I.

It is evident from the figure, that the angles a', a^1, e and f, are equals to each other. In the quadrilater A R N I, the angles A I N and A R N, are both right angles, therefore $A+h$ is equal to two right angles, and the sum of the angle a', a^1 and h also equals two right angles. From this, we deduce that $A+h$ equals $a'+a^1+h$, and A equals $a'+a^1$. But the angle a' is equal to the angle a^1, therefore a' equals a^1, equals $\frac{A}{2}$ and as a' is the angle of refraction

at the surface A B, it results that $\sin \frac{A}{2}$ equals $\sin a'$.

Furthermore, the sum of the angle $e+g+f$, equal two right angles and so, the sum of the angles $g+d$. Thus, $e+f$ equals d and as e and f are equals, e equals f, equals $\frac{d}{2}$.

Again, the angle a equals $e+a'$, and therefore e equals $a-a'$ but as e equals $\frac{d}{2}$, a equals $a'+\frac{d}{2}$. Now, as seen previously, a' equals $\frac{A}{2}$ and therefore a equals $\frac{A+d}{2}$ and as a is the angle of incidence to the surface A B, it results that $\sin \frac{A+d}{2}$, equals $\sin a$.

We obtain thus the equation:

$$\frac{\sin \frac{A+d}{2}}{\sin \frac{A}{2}} \text{ equals } \frac{\sin a}{\sin a'}$$

And as by Snell's Lew, the formula $\frac{\sin a}{\sin a'}$ gives the value of the refracting index of the medium, we have proven that the Fraunhofer formula:

$$\frac{\sin \frac{A+d}{2}}{\sin \frac{A}{2}}$$ equals the refracting Index of the prism A B C.

The value of this equation is great indeed, because, as stated previously, it permits an easy and exact determination of the *index of* refraction of any substance, which value represents the point of departure for all calculations necessary for the adaptations of substances to the requirements of optical instruments.

(To be Continued Next Month)

LECTURES

(Continued from Page 6)

In addition to members of the A.S.C., the following were among the guests present: George A. Blair, John I. Crabtree and Perry Conner of the Eastman Kodak Company; E. O. Blackburn of J. E. Brulatour, Inc.; Dwight Warren, Leonard M. Smith, Jules Cronjager, W. T. Crespinel, Allan B. Nicklin, Harry G. Mason, William W. Nobles and George Spear.

Dr. Hickman and Mr. Crabtree, who delivered the series of lectures, are members of the Eastman Research Laboratories, Rochester, N. Y., where they returned following the A.S.C. open meeting. Both are well-known authorities in photographic scientific circles, having made many important contributions to the profession in the way of treatises on the various phases of motion photography. Mr. Crabtree is chairman of the committee on papers of the Society of Motion Picture Engineers, of which he is a prominent member.

Van Buren in Hollywood

Ned Van Buren, A.S.C., who will be stationed at the Hollywood offices of Eastman in an advisory capacity to co-operate with cinematographers on panchromatic film, has spent the past several months in Rochester working with the laboratories there in preparation for his new position.

PANCHROMATIC NEGATIVE

(Continued from Page 8)

tral energy distribution. Data of this type for the light sources used extensively in motion picture work will be given in a later section.

VISUAL SENSITIVITY

The sensation produced when radiation falls upon the retina has three attributes: brilliance, hue, and saturation.

Brilliance is that attribute of any color in respect to which it may be classed as equivalent to some member of the series of grays ranging between black and white.

Hue is that attribute of certain colors in respect to which they differ characteristically

(Continued on Page 24)

PROJECTION • *Conducted by* EARL J. DENISON

More Projectors Bring Advantage

By Daniel B. Clark, A.S.C.

Auxiliary Instruments Insure Best Presentation, A.S.C. President Believes

WORD comes from the East of the rising popularity of the idea of installing three projectors in theatres where heretofore two have been the maximum.

Three as Minimum

It is my firm belief that three should be the minimum number of projectors in any motion picture house. There is little or no luxury in having two projectors in a theatre. They are nothing more than a necessity. When one reel of film is completed on one projector, the second projector must be ready to flash on the next reel immediately.

Mishaps

What happens if something goes wrong on the second projector? Necessarily there must be that delay, reminiscent of the days when "Next Reel Will Follow at Once" was a part of every cinema performance.

No Loss of Time

It is obvious that if a third projector is standing by for any possible emergency, the second reel of film can be threaded in it, and the show will continue without the unwelcome and ancient interruptions.

Increased Efficiency

Again, with the projection load being distributed among three machines, the strain is lessened by one third—and it is my personal belief that this is conducive to mechanical longevity. We may take a homely instance of a pair of shoes or a couple of suits of clothes which are worn day in and day out without relief. In appearance, they never perform their best and their lives are short.

Protection

In film production, we have long since learned the inadvisability of relying on a single camera. The second, or protecting camera, made its debut many years ago. Besides the second instrument, the practice has become, principally among the larger companies, to have one or more auxiliary and additional cameras.

Why It Pays

The money expended on extra cameras is soon repaid by production security and the improved quality of product.

So I believe it would be with projectors. The initial outlay would soon come back in presentation security and improved quality of exhibition.

Creco Organization Busy *with* Cinema Exhibition Exhibits

Herbert Sylvester, president of Creco Inc., recently chosen consulting engineer to the first annual Motion Picture Exposition to be held in the Ambassador Auditorium, March 7 to 12 inclusive, announces that one of the interesting exhibits will be the latest type radio transmitter, operating under government license and constructed by C. A. Riggs, A. M. I. R. E. of the Creco organization.

This transmitter has an effective range of 200 miles using radiophone transmission and 500 miles using telegraphic for straight communication.

These working distances are the minimum, under favorable conditions, double the distances can be covered.

This is the type of Radio apparatus that was used successfully during the filming of "Old Ironsides."

In process of construction at this time is the intercommunicating or two way radio broadcast portable station, weighing approximately 250 pounds and so arranged that it can be taken on any location.

This surprising feature of the set is that the director or studio executive can keep in constant touch with the studios while on location, or vice-versa according to conditions.

Panchromatic Tests

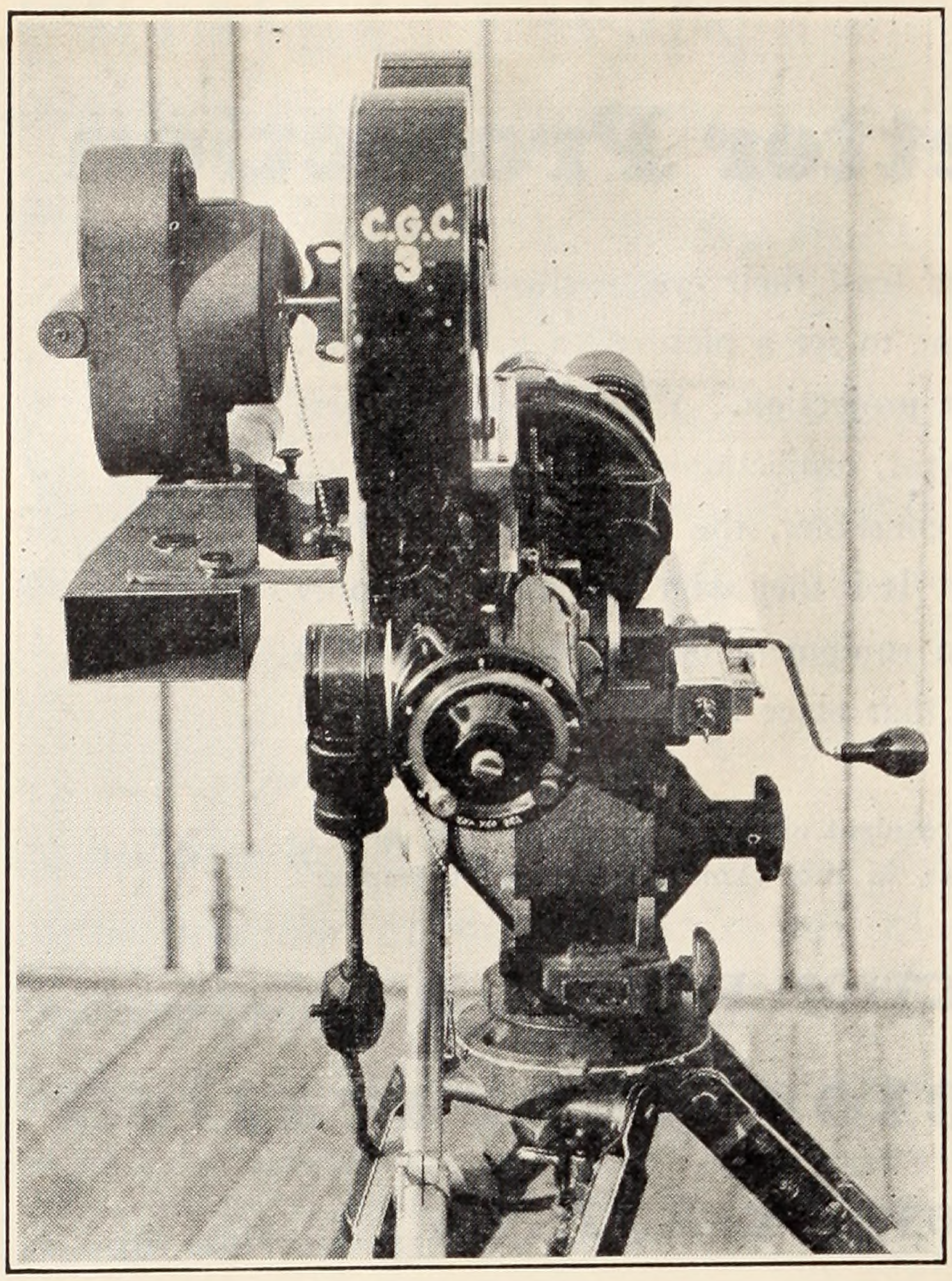
Spectrographic film tests will be on view in the Creco booths during the first annual Motion Picture Exposition, March 7 to 12, at the Ambassador Auditorium.

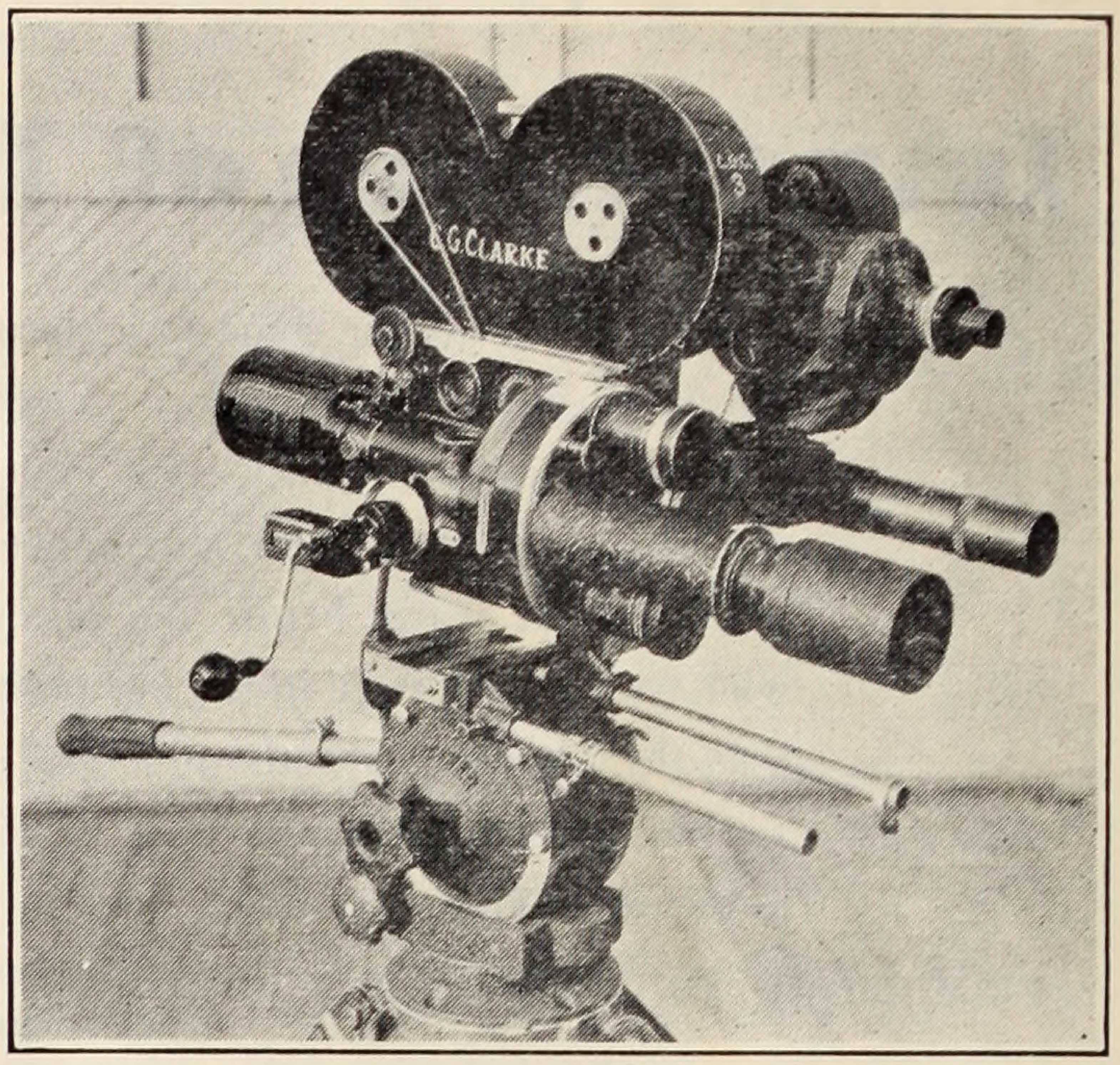
These tests pertain to color values and sensitivity of incandescent lighting on several grades of film stock, being carried out by Glen Gano, panchromatic film expert.

Charles Rosher, A.S.C., is in Hollywood again from a location trip to Lake Arrowhead, and is filming studio scenes for the Fox feature which is being directed by F. W. Murnau, noted German director.

* * * *

Abe Fried, A.S.C., is filming "Bertha, the Sewing Machine Girl," a Fox production, starring Madge Bellamy and directed by Irving Cummings.





Left: Rear view, showing Eyemo mounted on finder of standard Bell and Howell camera.

Above: Front and side view, showing entire combination Eyemo and standard Bell and Howell camera, mounted on Hoefner True Ball tripod head.

Combining an Eyemo and standard Bell and Howell camera, fitted to a Hoefner true ball tripod head, Charles G. Clarke, A.S.C., has an outfit which enables him to get close-ups and long shots simultaneously.

The Eyemo, being mounted in line with the large finder of the standard Bell and Howell, obtains the long shots.

The standard Bell and Howell, fitted with telephoto lens photographs the close-ups.

Both cameras being run with spring and motor power, Clarke can cover any difficult shots, aided by the free-moving true ball tripod head, without the necessity of hand cranking.

The mount for the Eyemo is so arranged that the finder can be swung aside, allowing easy accessibility for winding the spring of the small camera.

(Continued from Page 21)

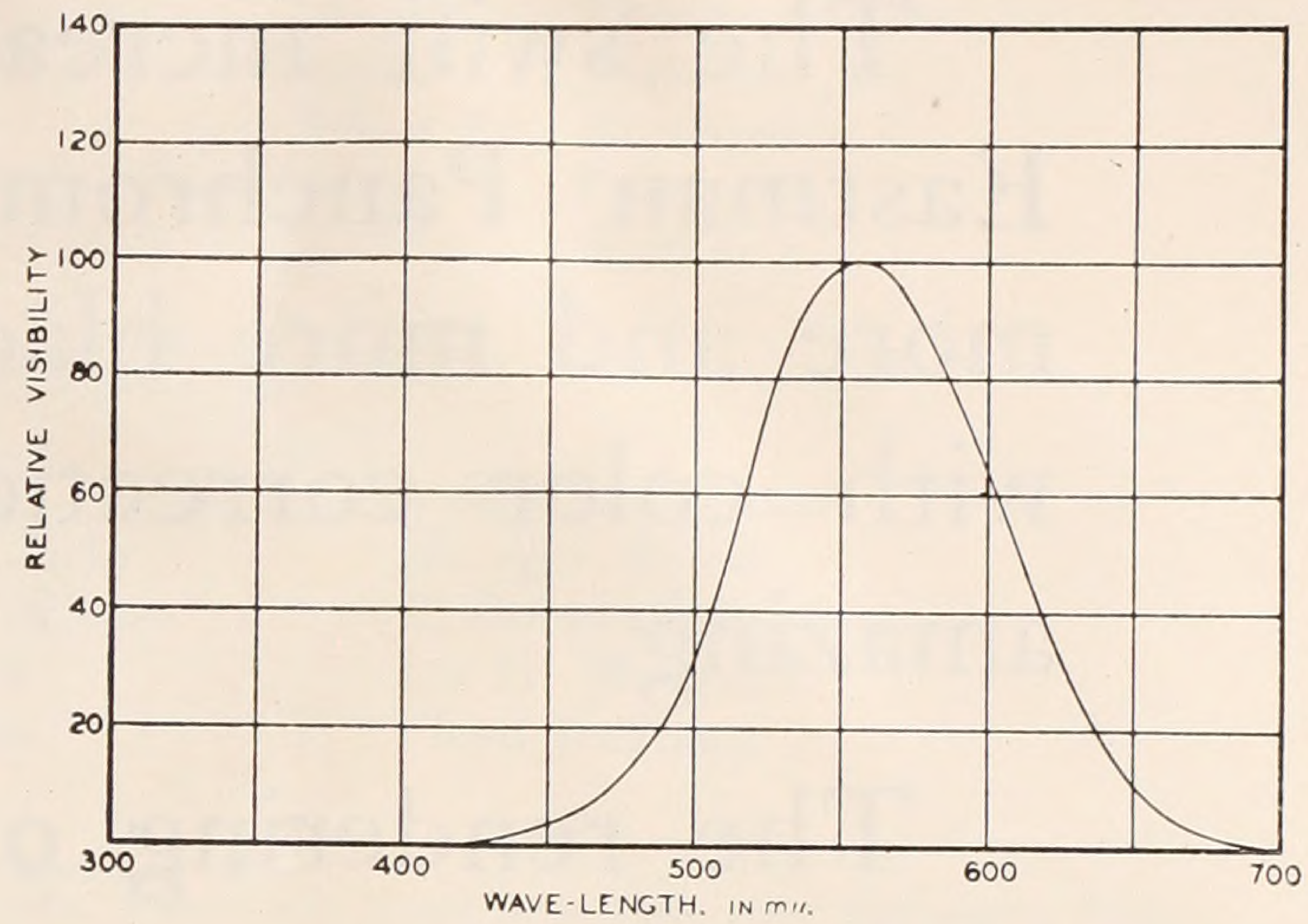
from a gray of the same brilliance and which permits them to be classed as reddish, yellowish, greenish, or bluish, etc.

Saturation is that attribute of all colors possessing a hue which determines the degree of difference from a gray of the same brilliance.

An object in the visual field is visible by virtue of the contrast between it and its immediate surroundings or background. This contrast may be due to a difference in hue (hue contrast), to a difference in saturation (saturation contrast), or to a difference in brilliance (brilliance contrast). In the case of a photographic reproduction such as a print or image projected onto a screen, since all hue and consequently all saturation contrast is absent, visibility of object detail depends entirely on the existence of a brilliance contrast. It follows therefore that the reproduction of detail by the photographic process must be accomplished by reproducing as a *brilliance contrast* that contrast which in the object may be due either to a contrast of *hue, saturation,* or *brilliance.* This being the case the visual function giving the relation between the wavelength of radiation and the brilliance of the resulting sensation is of prime importance. This relationship is known as the visibility function and its form is obtained by measuring the magnitude of the brilliance attribute of the sensation produced when the same radiation intensity of various wave-lengths acts upon the retina. In Fig. 2 this visibility curve is shown. This is obtained by plotting as ordinates the magnitude of the brilliance sen-

(Continued on Page 25)

(Continued from Page 24)



sation produced by the action of *constant energy* intensity of wave-lengths as indicated along the bottom of the figure. It will be noted that the maximum effect (sensation) is produced by radiation of wave-length 556 mu. The effect diminishes for shorter and longer wave-lengths so that at 430 mu and 690 mu the brilliance sensation for the same energy is only one per cent of that for wave-length 556 mu.

The wave-length at which maximum visibility occurs and to some extent the shape of the curve depends vitally upon the energy intensity level used in its determination. The curve in Fig. 2 was obtained at intensity levels such as exist in well illuminated interiors and out-door daylight conditions. At lower intensities the maximum of the curve shifts toward the shorter wave-lengths and if it is desired to apply such data to safelight and dark-room illumination problems the curve as given in Fig. 2 is not applicable.

The visibility curve is of fundamental importance in all problems dealing with the reproduction of visual tone values by the photographic process. Used in conjunction with the data relating to the distribution of energy in the spectrum of the various light sources and curves showing the spectral distribution of light reflected from objects, it provides a means of computing or estimating the relative visual brightness of variously colored objects.

(To be Continued Next Month)

How to Locate Members of the

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Telephone: GRanite 4274

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Arnold, John—with Metro-Goldwyn-Mayer Studios.

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Brodin, Norbert F.—with Columbia Studios.
Broening, H. Lyman—with F.B.O. Studios.
Brotherton, Joseph—with Universal.

Clark, Dan—with Tom Mix, Fox Studios.
Clarke, Chas G.—
Cowling, Herford T.—with Eastman Kodak Co., Rochester, N. Y.
Cotner, Frank M.—
Crockett, Ernest—
Cronjager, Henry—

Davis, Chas. J.—with Warner Bros., "Vitaphone," New York City.
Brotherton, Joseph—with Universal.
Doran, Robert V.—
Dored. John—Riga, Latvia.
Du Par, E. B.—with Warner Bros.
DuPont, Max B.—
Dubray, Joseph A.—with Tiffany Prod.

Edeson, Arthur—with First National, Burbank.
Evans, Perry—

Fildew, Wm.—
Fischbeck, Harry A.—with Famous Players-Lasky
New York City.
Fisher, Ross G.—with First National, Burbank.
Fried, Abe—with Fox Studios.

Gaudio, Gaetano—with First National, Burbank.
Gilks, Alfred—with Famous Players-Lasky
Good, Frank B.—
Gray, King D.—with Fox Studios.
Griffin, Walter L.—with David Hartford Productions.
Guissart, Rene—Paris, France.

Haller, Ernest—with Robert Kane Productions, New York City.
Heimerl, Alois G.—

Jackman, Floyd—with Fred W. Jackman Productions.
Jackman, Fred W.—directing Fred W. Jackman Productions.
Jennings, J. D.—with Buster Keaton.

Knechtel, Alvin V.—with First National, Burbank.
Koenekamp, Hans F.—
Kurrle, Robert—with First National, Burbank.

Lockwood, J. R.—
Lundin, Walter—with Harold Lloyd Productions, Metropolitan Studios.
Lyons, Reginald—with Fox Studios.

McCord, T. D.—
McGill, Barney—with United Artists, Pickford-Fairbanks Studio.
MacWilliams, Glen—with Fox Studios.
Meehan, George—with Fox Studios.
Milner, Victor—with Famous Players-Lasky.
Morgan, Ira H.—with Metro-Goldwyn-Mayer Studios.
Musuraca, Nicholas—

Norton, Stephen S.—with Tiffany Prod.

Palmer, Ernest S.—with Fox Studios.
Perry, Harry—with Famous Players-Lasky.
Perry, Paul P.—with Famous Players-Lasky.
Polito. Sol—with Ken Maynard, First National.

Ries, Park J.—
Roos, Len H.—Sydney, Australia.
Rose, Jackson J.—with Universal.
Rosher, Charles—with F. W. Murnau, Fox Studios.

Schneiderman, George—with Fox Studios.
Scott, Homer A.—
Seitz, John F.—with Metro-Goldwyn-Mayer Studios.
Sharp, Henry—with Metro-Goldwyn-Mayer Studios.
Snyder, Edward V.—with Pathe, Fine Arts Studio.
Smith, Steve, Jr.—
Steene, E. Burton—with Famous Players-Lasky, San Antonio.
Stumar, Chas.—with Universal.

Tolhurst, Louis H.—producing microscopic pictures, for Pathe.

Van Buren, Ned—with Eastman Kodak Co., Hollywood.
Van Enger, Charles—with First National, Burbank.
Van Trees, James C.—with First National, Burbank.

Warrenton, Gilbert—with Universal.
Wenstrom, Harold—
Whitman, Philip H.—with Scenario Dept., Mack Sennett Studios.
Wilky, L. Guy—

Eastman, George—Honorary Member.
Edison, Thomas A.—Honorary Member.
Webb, Arthur C.—Attorney

Meetings of the American Society of Cinematographers are held as called on Monday evenings in the A. S. C. assembly rooms—
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